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EXAMINER	
LI, SHI K	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 03/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/847,751	TOWNSEND, VANWINKLE (VAN) T.	
	Examiner	Art Unit	
	Shi K. Li	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (RTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 12, 16-18, 20 and 22-24 are rejected under 35 U.S.C. 102(a) as being anticipated by Lin et al. (W. Lin et al., "System Design and Optimization of Optical Amplified WDM-TDM Hybrid Polarization-Insensitive Fiber-Optic Michelson Interferometric Sensor", Journal of Lightwave Technology, Vol. 18, No. 3, March 2000).

Regarding claims 12 and 20, Lin et al. discloses in FIG. 9 a remote sensing system comprising an optical pulse generators for remotely generating a plurality of optical pulses, a splitter (1x4 DWDM DEMUX) and a sensing array for receiving the optical pulses. Lin et al. teaches in FIG. 1 Michelson interferometric sensors which act as modulators. (For example, see Stowe et al., "Demodulation of Interferometric Sensors Using a Fiber-Optical Passive Quadrature Demodulator", Journal of Lightwave Technology, Vol. LT-1, No. 3, September 1983, which explains that these sensors act as phase modulators.) Lin et al. teaches in FIG. 9 coupler (1x4 DWDM MUX) for combining the returned modulated pulses and receiver for receiving the modulated optical pulses.

Regarding claims 16 and 22, Lin et al. teaches in page 358, left col., second paragraph that the duty cycle is 1/17 for each wavelength for 8 sensors. That is, the duty cycle is about 1/(2N+1). For large N, this is approximately 1/2N.

Regarding claims 17 and 23, Lin et al. teaches in page 357, right col. that the telemetry system is in a TDM format.

Regarding claims 18 and 24, Lin et al. teaches in page 357, right col. that the telemetry system is in a WDM-TDM format.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (W. Lin et al., "System Design and Optimization of Optical Amplified WDM-TDM Hybrid Polarization-Insensitive Fiber-Optic Michelson Interferometric Sensor", Journal of Lightwave Technology, Vol. 18, No. 3, March 2000) in view of Nelson et al. (U.S. Patent 4,628,493) and McArthur et al. (U.S. Patent 5,272,476).

Regarding claim 1, Lin et al. discloses in FIG. 9 a telemetry system comprising a plurality of sensors arranged as a plurality of sensor arrays, a first optical splitter (1x4 DWDM DEMUX), a first transmitter consisting of four optical pulse generators, DWDM MUX and post EDFA(1) for transmitting a set of optical pulses, a plurality of sensor arrays for modulating the optical pulses, an optical combiner (1x4 DWDM MUX) for combining pulses modulated by the sensor arrays, and an optical receiver consisting of 1x4 DWDM DEMUX, four OBPFs and four receivers. The differences between Lin et al. and the claimed inventions are (a) Lin et al. does not specify the sensors as acoustic sensors, (b) Lin et al. does not teaches a plurality of subsystems for generating digital values based on analog signals received by the sensors. However, one of the most important applications of telemetry system is for seismic detection.

Nelson et al. teaches in col. 5, lines 42-46 that seismic signal is a type of acoustic signal. One of ordinary skill in the art would have been motivated to combine the teaching of Nelson et al. with the telemetry system of Lin et al. and use acoustic sensors so that the modified system is applicable to seismic detection. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use acoustic sensors, as taught by Nelson et al., in the telemetry system of Lin et al. so that the modified system is applicable to seismic detection.

The modified telemetry system of Lin et al. and Nelson et al. still fails to teach a plurality of subsystems for generating digital values based on analog signals received by the sensors. McArthur et al. teaches in FIG. 1 a telemetry sensor subsystem. McArthur et al. teaches to convert analog signal into digital format for transmission because digital signal has high noise immunity. One of ordinary skill in the art would have been motivated to combine the teaching of McArthur et al. with the modified telemetry system of Lin et al. and Nelson et al. because digital signals have high noise immunity. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to convert analog signal from the sensor into digital values, as taught by McArthur et al., in the modified telemetry system of Lin et al. and Nelson et al. because digital signals have high noise immunity.

Regarding claim 5, Lin et al. teaches in page 358, left col., second paragraph that the duty cycle is 1/17 for each wavelength for 8 sensors. That is, the duty cycle is about 1/(2N+1). For large N, this is approximately 1/2N.

Regarding claims 6-7, Lin et al. teaches in page 357, right col. that the telemetry system is in a WDM-TDM format.

Regarding claim 8, Lin et al. teaches in FIG. 1 that the sensors are modulated based on sensor information. In the modified telemetry system of Lin et al., Nelson et al. and McArthur et al., the modulators would have been driven by digital values based on signals generated by the sensors.

5. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al., Nelson et al. and McArthur et al. as applied to claims 1 and 5-8 above, and further in view of Sonderegger et al. (U.S. Patent 5,796,504).

Lin et al., Nelson et al. and McArthur et al. have been discussed above in regard to claims 1 and 5-8. The difference between Lin et al., Nelson et al. and McArthur et al. and the claimed invention is that Lin et al., Nelson et al. and McArthur et al. do not teach to use the telemetry system as an underwater acoustic telemetry system for use in submersible vehicle. Sonderegger et al. teaches in col. 7, line 64-col. 8, line 20 to mount acoustic array to the hull of a submarine for underwater application. One of ordinary skill in the art would have been motivated to combine the teaching of Sonderegger et al. with the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. for applying the telemetry system for submarine application because data, e.g., seismic information, collected in such manner is reliable and accurate. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to mount sensors to the hull of a submarine for underwater application, as taught by Sonderegger et al., in the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because data, e.g., seismic information, collected in such manner is reliable and accurate.

Regarding claim 3, it is obvious to put active components inside the submersible vehicle so that they do not need to be sealed for waterproofing and can be easily accessed for maintenance.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al., Nelson et al. and McArthur et al. as applied to claims 1 and 5-8 above, and further in view of Guy (U.S. Patent 6,690,886 B1).

Lin et al., Nelson et al. and McArthur et al. have been discussed above in regard to claims 1 and 5-8. The difference between Lin et al., Nelson et al. and McArthur et al. and the claimed invention is that Lin et al., Nelson et al. and McArthur et al. do not teach that the multiplexer and demultiplexer are passive. Guy teaches in col. 5, lines 14-24 passive multiplexer and demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Guy with the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because passive devices require no electrical and is reliable and maintenance-free. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use passive devices for the multiplexer and demultiplexer, as taught by Guy, in the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because passive devices require no electrical and is reliable and maintenance-free.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al., Nelson et al. and McArthur et al. as applied to claims 1 and 5-8 above, and further in view of Nakamura et al. (U.S. Patent 5,784,188).

Lin et al., Nelson et al. and McArthur et al. have been discussed above in regard to claims 1 and 5-8. The difference between Lin et al., Nelson et al. and McArthur et al. and the claimed

invention is that Lin et al., Nelson et al. and McArthur et al. do not teach a modulator that modulates by passing and blocking optical signal. However, it is well known in the art that electro-absorption (EA) modulators are widely used for modulating optical signal by blocking (absorbing) or passing optical signal. For example, Nakamura et al. discloses in FIG. 1 an EA modulator. One of ordinary skill in the art would have been motivated to use an EA modulator with the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because an EA modulator realizes a higher indicial response and a considerable reduction in wavelength chirp (see col. 1, lines 16-17 of Nakamura et al.). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use EA modulators, as taught by Nakamura et al., in the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because a EA modulator is effective for modulating signals in wide frequency range for transmitting over long distance.

8. Claim 10-11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al., Nelson et al. and McArthur et al. as applied to claims 1 and 5-8 above, and further in view of Green et al. (U.S. Patent 6,515,939 B1).

Lin et al., Nelson et al. and McArthur et al. have been discussed above in regard to claims 1 and 5-8. The difference between Lin et al., Nelson et al. and McArthur et al. and the claimed invention is that Lin et al., Nelson et al. and McArthur et al. do not teach to split the individual wavelength channel into signals for each sensor in a sensor array. Green et al. teaches in FIG. 5 that in a TDM arrangement, pulse stream is divided into a plurality of branches by splitter 507 for each individual sensor and the responses from the sensors are combined by the same device, act as a combiner, into a single bit stream. One of ordinary skill in the art would have been

motivated to combine the teaching of Green et al. with the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because the approach of Green et al. allows a single pulse stream to be used for many sensors via TDM technique and reduces the number of lasers. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a splitter to split a wavelength pulse stream for each sensor, as taught by Green et al., in the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because the approach of Green et al. allows a single pulse stream to be used for many sensors via TDM technique and reduces the number of lasers. Note that the modified telemetry system of Lin et al., Nelson et al., McArthur et al. and Green et al. has four splitters, which also act as combiners, one for each wavelength channel (or 8-sensor subarray).

Regarding claim 10, the splitters and combiners correspond to the splitter and combiners 507 of FIG. 5 of Green et al.

Regarding claim 11, the splitters correspond to splitter 507 of FIG. 5 of Green et al. and the combiner corresponds to the DWDM MUX at the right-hand side of FIG. 9 of Lin et al.

9. Claims 13 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (W. Lin et al., "System Design and Optimization of Optical Amplified WDM-TDM Hybrid Polarization-Insensitive Fiber-Optic Michelson Interferometric Sensor", Journal of Lightwave Technology, Vol. 18, No. 3, March 2000) in view of Nelson et al. (U.S. Patent 4,628,493).

Lin et al. has been discussed above in regard to claims 12, 16-18, 20 and 22-24. The difference between Lin et al. and the claimed invention is that Lin et al. does not teach acoustic sensors. However, one of the most important applications of telemetry system is for seismic detection. Nelson et al. teaches in col. 5, lines 42-46 that seismic signal is a type of acoustic

signal. One of ordinary skill in the art would have been motivated to combine the teaching of Nelson et al. with the telemetry system of Lin et al. and use acoustic sensor so that the modified system is applicable to seismic detection. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use acoustic sensors, as taught by Nelson et al., in the telemetry system of Lin et al. so that the modified system is applicable to seismic detection.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (W. Lin et al., "System Design and Optimization of Optical Amplified WDM-TDM Hybrid Polarization-Insensitive Fiber-Optic Michelson Interferometric Sensor", Journal of Lightwave Technology, Vol. 18, No. 3, March 2000) in view of Sonderegger et al. (U.S. Patent 5,796,504).

Lin et al. has been discussed above in regard to claims 12, 16-18, 20 and 22-24. The difference between Lin et al. and the claimed invention is that Lin et al. does not teach to use the telemetry system as an underwater acoustic telemetry system for use in submersible vehicle. Sonderegger et al. teaches in col. 7, line 64-col. 8, line 20 to mount acoustic array to the hull of a submarine for underwater application. One of ordinary skill in the art would have been motivated to combine the teaching of Sonderegger et al. with the telemetry system of Lin et al. for applying the telemetry system for submarine application because data, e.g., seismic information, collected in such manner is reliable and accurate. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to mount sensors to the hull of a submarine for underwater application, as taught by Sonderegger et al., in the telemetry system of Lin et al. because data, e.g., seismic information, collected in such manner is reliable and accurate.

11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (W. Lin et al., "System Design and Optimization of Optical Amplified WDM-TDM Hybrid Polarization-Insensitive Fiber-Optic Michelson Interferometric Sensor", Journal of Lightwave Technology, Vol. 18, No. 3, March 2000) in view of Guy (U.S. Patent 6,690,886 B1).

Lin et al. has been discussed above in regard to claims 12, 16-18, 20 and 22-24. The difference between Lin et al. and the claimed invention is that Lin et al. does not teach that the multiplexer and demultiplexer are passive. Guy teaches in col. 5, lines 14-24 passive multiplexer and demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Guy with the telemetry system of Lin et al. because passive devices require no electrical and is reliable and maintenance-free. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use passive devices for the multiplexer and demultiplexer, as taught by Guy, in the telemetry system of Lin et al. because passive devices require no electrical and is reliable and maintenance-free.

12. Claims 19 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (W. Lin et al., "System Design and Optimization of Optical Amplified WDM-TDM Hybrid Polarization-Insensitive Fiber-Optic Michelson Interferometric Sensor", Journal of Lightwave Technology, Vol. 18, No. 3, March 2000) in view of Nakamura et al. (U.S. Patent 5,784,188).

Lin et al. has been discussed above in regard to claims 12, 16-18, 20 and 22-24. The difference between Lin et al. and the claimed invention is that Lin et al. does not teach to modulate received optical pulses by passing and block optical pulses. However, it is well known in the art that electro-absorption (EA) modulators are widely used for modulating optical signal by blocking (absorbing) or passing optical signal. For example, Nakamura et al. discloses in

FIG. 1 an EA modulator. One of ordinary skill in the art would have been motivated to use an EA modulator with the telemetry system of Lin et al. because an EA modulator realizes a higher indicial response and a considerable reduction in wavelength chirp (see col. 1, lines 16-17 of Nakamura et al.). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use EA modulators, as taught by Nakamura et al., in the telemetry system of Lin et al. because a EA modulator is effective for modulating signals in wide frequency range for transmitting over long distance.

Response to Arguments

13. Applicant's arguments filed 5 January 2006 have been fully considered but they are not persuasive.

The Applicant argues that if the Examiner contends that the sensors disclosed in Lin correspond to the optical modulators recited in claims 12 and 20, then Lin does not teach or suggest an array of sensors; if the Examiner contends that the sensors disclosed in Lin correspond to the array of sensors recited in claims 12 and 20, then Lin does not teach or suggest optical modulators. The Applicant argues that Lin does not teach or suggest both an array of sensors **and** a plurality of optical modulators as recited in claims 12 and 20. The Examiner disagrees. A closer look at FIG. 1 of Lin indicates that an interferometric sensor comprises several parts, namely, two arms (or legs) and a fiber coupler (FC). One of the arms is a reference arm and the other is the senor part for sensing acoustic pressure. The fiber coupler acts as an interferometer and takes the reflected signals from the reference arm and the sensor arm and generates a phase modulation. That is, the sensor arm of FIG. 1 of Lin corresponds to the sensor

recited in claims 12 and 20 and the fiber coupler corresponds to the modulator recited in claims 12 and 20.

The Applicant argues that if the Examiner contends that the sensors disclosed in Lin correspond to the plurality of subsystems recited in claim 1, then Lin does not teach or suggest a plurality of sensors; if the Examiner contends that the sensors disclosed in Lin correspond to the plurality of sensors recited in claim 1, then Lin does not teach or suggest a plurality of claim 1. The Applicant argues that Lin does not teach or suggest both a plurality of sensors **and** a plurality of subsystems as recited in claim 1, and Nelson and McArthur also fail to teach or suggest these limitations. The Examiner disagrees. As indicated above, a sensing arm of an interferometric sensor of Lin corresponds to a sensor of instant claim. Furthermore, Nelson et al. teaches in FIG. 1 telemetry modules correspond to subsystems of instant claim.

Regarding claim 9, the Applicant argues that there is no suggestion to combine the cited references. The Examiner disagrees. As stated above in the rejection, Nakamura et al. teaches in col. 1, lines 15-21 that EA modulator is effective for transmitting a modulated signal in a wider frequency band over a longer distance without using any transponders. One of ordinary skill in the art would have been motivated to combine the teaching of Nakamura et al. with the modified telemetry system of Lin et al., Nelson et al. and McArthur et al. because of such desirable feature of EA modulator.

The Applicant also suggests that there is lack of evidence that an EA modulator modulates by passing or block optical pulses. Nakamura et al. may not teach the operation characteristic of EA modulator. However, it is well known to one of ordinary skill in the art. For example, Suzuki et al. (U.S. Patent 5,889,607) teaches in FIG. 2 that when the applied

voltage is above –4 volts, the modulator passes light and when the applied voltage is below –4 volts, it blocks light transmission.

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (8:30 a.m. - 5:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

skl
1 March 2006

Shi K. Li
Patent Examiner